

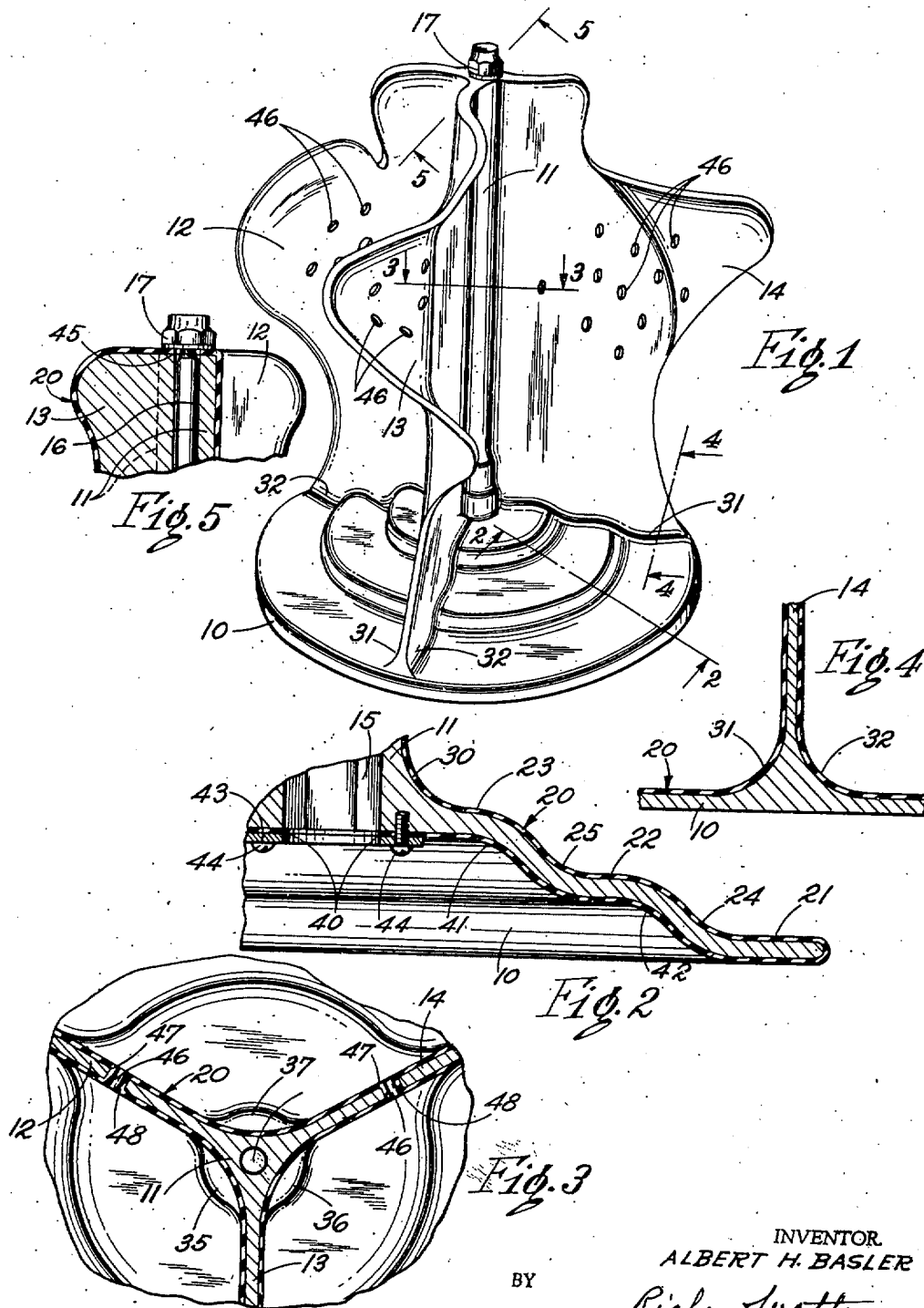
Oct. 7, 1941.

A. H. BASLER
WASHING MACHINE AGITATOR

2,257,932

Filed Nov. 14, 1938

2 Sheets-Sheet 1



INVENTOR
ALBERT H. BASLER

BY
Richey Watts
ATTORNEYS

Oct. 7, 1941.

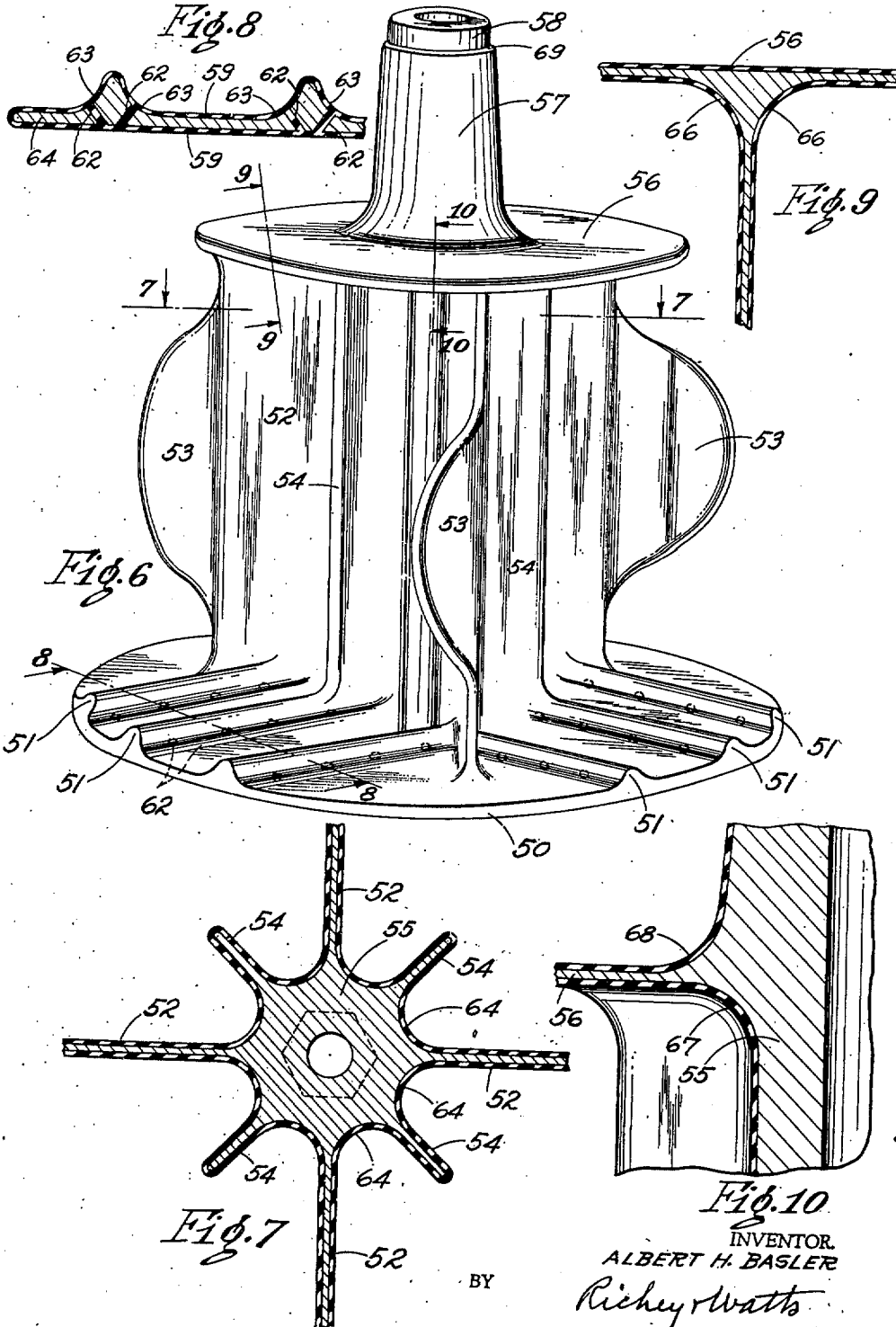
A. H. BASLER

2,257,932

WASHING MACHINE AGITATOR

Filed Nov. 14, 1938

2 Sheets-Sheet 2



INVENTOR.
ALBERT H. BASLER
Richey Watts
ATTORNEYS

UNITED STATES PATENT OFFICE

2,257,932

WASHING MACHINE AGITATOR

Albert H. Basler, East Cleveland, Ohio

Application November 14, 1938, Serial No. 240,235

3 Claims. (Cl. 68—134)

This invention relates to agitators for washing machines and more particularly relates to agitators adapted to reduce the wear on clothes during the process of washing and improve the washing action, and to methods of making such agitators.

Most washing machine agitators in use at the present time consist of metallic castings and of necessity such agitators have hard surfaces which have an abrasive effect on the clothes being washed, resulting in rapid wear of the clothes during the washing operation. Initially, washing machine agitators ordinarily have highly polished surfaces, but with continued use, these surfaces become scratched and pitted, increasing the abrasive action on the clothes. Some agitator designs include vanes having a number of holes drilled therethrough, the purpose of the holes being to improve the circulation of the fluid and to give a better washing action. The holes in such agitators must be drilled, reamed and chamfered with great care, otherwise the holes will present sharp edges which will rapidly wear the fabrics being washed.

It has been previously proposed to cover washing machine agitators by vulcanizing rubber thereto, or by coating with various synthetic resins such as phenol condensation products. However, such proposals have not met with any considerable success for the following reasons, among others: the operation of vulcanizing rubber to an agitator of complicated form is so expensive that it is prohibitive; the rubber so vulcanized may not adhere permanently to the base material forming the agitator and does not have a soft smooth surface; and it is impossible to vulcanize rubber to agitators having perforated vanes. The synthetic resin coatings generally speaking are thin and hard, are subjected to wear, are apt to become scratched or to crack and chip in severe service, and do not provide a soft, resilient and smooth surface. Such coatings are so thin that they follow almost exactly the contour of the base on which they are deposited, and therefore the base material must be carefully polished before the coating is applied and must be formed with just as great a degree of care as in the case of uncoated metallic agitators.

According to my invention I apply to the agitators a smooth, resilient coating of rubber or rubber-like material by depositing the material from a solution or dispersion thereof in which the agitator frame or base is immersed. Thus I am able economically to provide washing ma-

chine agitators of practically any desirable form with a smooth resilient coating of deposited rubber which, while it is soft, resilient and flexible to the touch, is very tough and adheres permanently to the base or frame of the agitator. The coatings can be of almost any desired color, the colors being bright and permanent. Such attractively colored agitators greatly improve the salability of the washing machines in which they are installed.

By depositing the rubber or rubber-like material from a solution, smooth, continuous, coatings can be deposited on frames or supports of practically any desired shape, without the necessity of providing expensive molds or other equipment which would be necessary if the vulcanizing process were employed. Further, the process of depositing the coating material from a solution produces a coating which, for all practical purposes, does not deteriorate with age, which is resistant to wear, and which is not adversely affected by the soaps or other solutions employed in washing machines even if they be strongly alkaline or corrosive in character.

I have discovered that deposited rubber coatings can be caused to adhere firmly and permanently, provided certain precautions are taken in the design and construction of the support or frame on which the rubber coating is deposited. Preferably the frame or support is formed of metal. Aluminum or alloys of aluminum are especially suitable, for such metals are light and strong, do not react with the deposited coating and are resistant to corrosion. The denser the structure of the metal the better the adhesion of the coating thereto. Therefore I preferably form the frames of the agitators from rolled aluminum sheets, from forgings, or from dense castings, preferably die castings or permanent mold castings. The deposited rubber coatings will adhere permanently thereto provided either that sharp inside corners or acute angles are eliminated, or that the rubber coating is keyed to the support in the region of the inside corners or acute angles by drilling holes in the base, which become filled with the deposited rubber and function to retain the coating in place thereon. In the case of dense castings, for example, permanent adhesion of the rubber coating to the base material can be obtained either by employing concave surfaces having radii of preferably not less than about $\frac{1}{8}$ of an inch in place of the comparatively sharp acute angles ordinarily encountered or by using holes or openings to key the rubber to the base in the

corners, in which event the radius of the inside corners can be greatly reduced, it being possible to employ smaller radii by increasing the number of holes formed in the region of the corners or angles. For example, a rubber coating with adequate adhesion can be deposited on a concave surface having a radius of about $\frac{3}{8}$ of an inch by employing a single row of holes about $\frac{1}{4}$ inch in diameter and spaced 1 inch apart. For a corner which is substantially sharp or which has only a small fillet, it may be necessary to employ three rows of holes spaced $\frac{1}{2}$ inch apart. Larger radii can of course be employed satisfactorily. In castings of less dense materials I prefer to employ radii greater than those specified above.

As stated above, by designing the base or frame with these limitations in view, it is possible with slight modifications to cover satisfactorily any type of washing machine agitator of which I am now aware. In the drawings I have illustrated the invention as applied to two particular types of agitators. Figure 1 is a perspective view of an agitator having a shape generally similar to a well known type and provided with a rubber covering in accordance with my invention; Figure 2 is a section as indicated on line 2—2 of Figure 1; Figure 3 is a section on large scale as indicated by line 3—3 of Figure 1; Figure 4 is a section as indicated by line 4—4 on Figure 1; Figure 5 is a section as indicated by line 5—5 on Figure 1; Figure 6 is a perspective view of a different type of agitator having a form generally similar to the agitator of a well known type and having a cover of rubber or rubber-like material provided in accordance with my invention; and Figures 7, 8, 9, and 10 are sections through such agitator as indicated by the lines 7—7, 8—8, 9—9, and 10—10 on Figure 6, respectively. Throughout the drawings, the thickness of the coating material is exaggerated for the sake of convenience in illustration.

The agitator shown in Figure 1 comprises a frame or support preferably in the form of a casting having a base portion indicated generally at 10, a vertical central portion or center post indicated at 11 and radial extending vanes 12, 13 and 14 which are curved as shown to produce the desired action when the agitator is oscillated in a washing machine. The agitator may be oscillated by an angular shaft (not shown) projecting upwardly from the power unit of the washing machine and engaging the angular portion 15 of a recess within the center post 11, and may be secured to the shaft by means of a bolt 16 (see Fig. 5) extending through the center post into engagement with the shaft, the upper end of the bolt being provided with a nut 17 or screw head so that the agitator may be released and removed from the machine if desired. Preferably the casting is of aluminum or alloy of aluminum in the form of a dense casting, such as a permanent mold or die casting. The casting is provided in accordance with my invention with a coating or deposit 20 of rubber which firmly adheres to the aluminum throughout the entire area thereof, or at least that portion that is adapted to come into contact with the clothes when the agitator is incorporated in a washing machine. This material may be deposited to substantially any desired thickness but preferably is of about .035" to .040" as this thickness gives ample wearing qualities, has the desired resilience and softness, and can be applied rapidly and economically.

The rubber coating may be deposited on the

casting from solutions by various methods, preferred methods being described in detail in Patent No. 1,959,201, dated May 15, 1934, and Reissue Patent No. 19,155, reissued May 8, 1934.

Briefly, an adhesive is first applied to the frame or support, a coagulant is applied to the adhesive, then the frame having the coating of adhesive material thereon is dipped into, for example, an aqueous dispersion of natural rubber or latex or various synthetic rubber-like materials such as Neoprene, Buna, and the like and allowed to remain for a sufficient time for a coating of the desired thickness to be built up thereon. The preferred thickness can be built up in a few minutes with only a single dip being required. Thereafter the frame or support is removed from the solution, the deposited material is permitted to dry and is finally cured under heat. Those skilled in the art will appreciate that the processes, such as the intermittent dipping or electrolytic deposit process for example may be employed to produce the coating.

In order to prevent the deposited rubber from pulling away from inside corners or concave surfaces of the frame or support, that is from areas thereon where two surfaces meet at an angle of less than 180° , I preferably form all such inside corners or concave surfaces with comparatively large radii as shown. For example the base portion 10 comprises a series of steps 21, 22 and 23 connected by intermediate curved portions 24 and 25. Heretofore, metallic agitators of the same general shape as these have had substantially cylindrical vertical surfaces between the steps, with sharp corners or very small fillets in the inside corners. Contrary to this practice, and to insure adhesion of the rubber deposit, I employ sweeping curves, the radius of curvature of the concave portions 24 and 25 being preferably not less than $\frac{3}{8}$ of an inch with the materials specified. At the juncture between the base portion 10 and the center post 11 the casting is preferably provided with a similar large radius as indicated at 30. A similarly large radius is preferably employed at the intersections between the vanes 12, 13 and 14 and base portion 10, the concave surfaces at the intersection between the vane 14 and the base portion being indicated at 31 and 32 in Figure 4. A similar scheme is employed at the intersections between the vanes 12, 13 and 14 and the center post 11. As shown in Figure 3 there are large radii in the portions 35, 36 and 37 which insure proper adherence of the rubber-like material to the base in these concave areas.

The entire under surface of the base 10 need not be coated with rubber as this surface does not come into contact with the clothes during the washing operation. Thus the rubber can be terminated on the under surface of the base 10 at any convenient point. However, I preferably continue the coating throughout the under surface thereof to the region adjacent the opening 15, the edge of the rubber coating being indicated at 40. To assure the proper adherence of the material to the under side of the base, the concave areas of the under side of the base preferably have radii of at least $\frac{3}{8}$ of an inch as indicated particularly at 41 and 42.

To prevent any possibility of fluid working in between the rubber coating and the base material at the edge 40 of the coating I preferably employ a washer or ring 43 which may be secured to the metal of the base as by screws 44. The washer firmly engages the rubber in the region

adjacent the edge 40, holding the edge portion in contact with the metallic base. Thus all possibility of fluid penetrating between the rubber coating and the underlying metal is prevented, and the edge of the coating is permanently retained in position.

At the top of the agitator, the coating terminates at the upper end of the central portion 11 as indicated at 45 in Figure 5. The rubber coating is held in firm engagement with the metallic base material at this point by the nut 17 which, as pointed out above, also functions to hold the agitator onto the oscillating shaft of the washing machine. Thus it will be seen that the rubber coating is continuous from the top of the agitator to the underside of the base thereof, and that the edge portions where the coating terminates are held in firm engagement with the base material by the nut 17 and the washer 43 at the top and bottom of the agitator, respectively.

As illustrated particularly in Figures 1 and 3 the agitator vanes 12, 13 and 14 may, if desired, be provided with perforations 46 of sufficient size to permit the washing fluid to pass through the vanes, to improve the circulation of the washing fluid. As shown in Figure 3 the rubber is deposited on the inner surfaces of the perforations and forms a smooth resilient coating which covers the sharp edges 47 thereof as indicated particularly at 48. The vanes of agitators made according to my invention can be provided with perforations with little additional expense, as it is only necessary to drill, punch, or otherwise form the openings. No reaming or chamfering operations are required for any sharp or rough edges that may be left by the operation of forming the holes will be completely covered by rubber, which will prevent any possibility of damage to the fabrics being washed caused by contact with the edges of the perforations. Thus with agitators made according to my invention, no particular care need be exercised in the formation of the perforations for any roughness which may occur will only result in better adherence of the rubber to the base and cannot possibly damage the clothes. Furthermore, the perforations function to key the rubber layers to the metallic base as the rubber extends continuously through the perforations, and the rubber within the perforations serves to hold the rubber coatings on both sides of the vane in firm engagement with the opposite surfaces thereof.

Throughout the rubber covered surfaces of the agitator all concave surfaces or inside corners are preferably formed with inside corners having radii of curvature of at least $\frac{1}{2}$ of an inch. With such radii and with a frame or support of material of proper characteristics as to density, the coating will adhere firmly to all the concave surfaces without the necessity of employing holes or keys.

In Figures 6 to 10 I have illustrated the manner in which my invention may be applied to an agitator of another type. The agitator shown in these figures comprises a base portion 50 having formed thereon a number of horizontal ribs 51. The agitator is provided with four equally spaced upwardly extending vanes 52 having curved portions 53 and there are smaller straight vanes 54 disposed between the ribs 52. The ribs 52 and 54 extend radially from the central portion or center post 55 and at their upper portion the ribs are joined to a radially extending disk portion 56.

knurled nut 58 which engages a threaded shaft within the center post and functions to hold the agitator in place in the washing machine.

As described in conjunction with the Figures 1 to 5, the frame or support preferably comprises an aluminum casting and all of the surfaces of the agitator, or at least those which are likely to come into contact with the material being washed are provided with a coating 59 of rubber deposited on the frame from a solution or dispersion as previously described. In order to assure adhesion of the rubber to the ribs 51 and the concave surfaces adjacent the ribs, I preferably drill a series of holes in each of the concave surfaces. These holes are of such diameter, about $\frac{1}{4}$ of an inch for example, that when the base or frame is dipped into or otherwise coated with the rubber solution, the holes will be completely filled by the rubber deposited therein as shown at 62 which will be integral with the adjacent rubber coatings 59. Preferably the holes are about $\frac{1}{4}$ of an inch in diameter and may be spaced about 1 inch apart longitudinally. The rubber deposited in the holes as shown particularly in Figure 8 serves to key the rubber to the concave surfaces 63 and thus prevents any possibility of the coating being loosened in these areas. In the embodiment shown the holes extend through the base 58 and thus function to additionally secure the rubber coating 59 on the under side 64 of the base. When this method of keying the coating to the base is employed ample adhesion can be obtained with radii of about $\frac{1}{2}$ of an inch and in some instances it may be desirable to employ such smaller radii rather than to use larger radii and eliminate the holes 62.

In the remaining portions of the agitator the radii are increased so that sufficient adhesion between the rubber coating and the casting is obtained at all points without the necessity of employing the holes or other keying devices. Thus the concave surfaces 64 between the vanes 52 and 54 all have radii of preferably not less than $\frac{1}{2}$ of an inch to insure the adhesion of the coating at this point. This construction is illustrated particularly in Figure 7. As shown in Figure 9 the concave surfaces 66 formed at the intersection between the vanes and the disk portion 56 have a sufficiently great radius, preferably not less than $\frac{1}{2}$ of an inch, to insure adherence of the rubber coating to the casting. Likewise as shown in Figure 10 the radius of the concave surfaces 67 and 68 adjacent the intersection of the disk 56 and the central portion 55 is also sufficiently large, preferably at least $\frac{1}{2}$ of an inch, to insure adhesion of the deposited coating.

In this modification, as in the previous modification, the rubber coating is preferably continued beneath the base 50 and the edge of the rubber adjacent the central opening in the agitator is clamped by a washer similar to the washer described in conjunction with the previous modification. Similarly the upper edge portion 69 of the coating is held in firm engagement with the top of the central portion 55 by the knurled nut 58, the nut functioning in the same manner as the nut 16 as shown in Figures 1 and 5.

If it is desired to increase the thickness of the coating in the regions particularly subject to wear such as the edges of the vanes, this can be easily accomplished by applying an additional amount of the rubber solution or dispersion to

posited coating in the regions where the thicker deposit is desired.

It is to be understood that my invention can be applied to washing machine agitators of various different types without departing from the spirit and scope thereof. For example, some types of washing machine agitators have a shorter center post or central portion and do not employ a nut or any other similar device for retaining the agitator on the oscillating shaft of the washing machine. In this type of agitator the base material is solid at the top of the center post and the rubber covering is extended across the top of the center post thus eliminating the exposed edges at this point.

By my invention it is possible to provide agitators which will reduce the wear on the fabrics being washed and which have a more efficient washing action than any agitators heretofore produced. Agitators made according to my invention are durable, resist wear and abrasion of all kinds and are resistant to the washing solutions ordinarily employed in washing machines. The deposited rubber coatings can be made in various attractive colors without any material additional cost. The agitators can be constructed economically, for no expensive molds or dies are required in the application of the coating and the coating can be applied rapidly and inexpensively. Because the surfaces of the agitators which come in contact with the materials being washed are protected by a smooth, resilient coating, it is unnecessary to polish the metal frames or bases before applying the coating material thereto, and thus the expense of careful finishing operations, which are required with ordinary washing machine agitators, is eliminated.

By the use of the term "rubber" in the specification and claims I intend to include various natural rubbers or rubber-like substances such as caoutchouc, balata, gutta-percha and also synthetic rubbers or rubber-like substances such as Chloroprene rubbers and materials such as Neoprene or Buna or mixtures of these substances or similar substances. The solutions or dispersions of the materials employed may have any desired degree of concentration or viscosity to meet the requirements of the coating operation and while the process has been described herein as a dipping process the rubber may if desired be applied to the forms by other methods as by spraying or by electro-deposition. Depending upon the character of the material employed, the agitators having the deposited rubber thereon may be dried and cured at room temperature or slightly above, or, if desired, may in addition be cured at an elevated temperature.

In the foregoing specification I have described a preferred form of my invention as applied to two different types of washing machine agitators. Those skilled in the art will appreciate that the invention may be applied to agitators of almost any design and that the methods and materials described herein can be varied without departing from the teachings of my invention. It is therefore to be understood that the foregoing description is given by way of example only and that my invention is not limited to the preferred form described herein or in any manner other than by the scope of the appended claims when given the range of equivalents to which my patent may be entitled.

I claim:

1. A composite washing machine agitator comprising a metal frame including a base, an upright central post, and a plurality of generally radial vanes connected to the base and post, the surfaces at the junctions of the vanes with the base and post being concave and formed by radii of at least $\frac{3}{8}$ " in length, and a layer of deposited rubber on the surfaces of said frame which are to be exposed to articles being washed in a washing machine, said layer adhering firmly to substantially the entire surface of the frame covered thereby.

2. A composite washing machine agitator comprising a metal frame including a base, an upright central post and a plurality of generally radial vanes connected to said base and post and having a plurality of perforations extending therethrough, the surfaces at the junctions of the vanes with the base and post being concave and formed by radii of at least $\frac{3}{8}$ " in length, and a layer of deposited rubber on the surfaces of said base, post and vanes and of the perforations of the latter, which surfaces are to be exposed to articles being washed in a washing machine, said layer adhering firmly to substantially the entire surface of the frame covered thereby.

3. A composite washing machine agitator comprising a metal frame including a base, an upright central post having an axial opening therethrough and a plurality of vanes connected to said base and post and extending generally radially outward from the latter, the surfaces at the junctions of the vanes with the base and post being concave and formed by radii of at least $\frac{3}{8}$ " in length, a layer of deposited rubber adhering firmly to all the surfaces of said frame covered thereby, said layer terminating adjacent the ends of the axial opening in the post, and means for clamping the coating to the frame adjacent to the ends of said opening.

ALBERT H. BASLER.